Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Restricted Linear Mixture Regression Models: Estimation,

Power and Sample Size Calculations

By

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This dissertation focuses on the restricted linear mixture regression models (RLMRM). RLMRM are mixture models that have some regression parameters set to be equal across the mixture components, while, others regression parameters (unrestricted) may be unequal across components.

We use the Expectation-Maximization (EM) algorithm to calculate the maximum likelihood estimates (MLE) for the regression parameters and mixing proportions. We also provide the standard errors for the MLE. We prove that the ordinary least square (OLS) estimator of the unrestricted parameters is the weighted sum of the true parameters with the mixing proportions as their corresponding weights, and the OLS estimator of the restricted parameters is unbiased. We further provide two EM initialization procedures for two special RLMRM, mixture intercept model (MIM), where only intercepts may differ cross components, and mixture slope model (MSM), where only slopes may differ cross components.

We develop a method to decompose the distribution of the likelihood ratio test statistic (LRTS) for testing for a two-component mixture in normal mixture model (NMM), MIM and MSM under the alternative. We obtain power and sample size calculation formulae for those mixture models.

Through simulation studies, we (1) provide null LRTS distributions of the test for two-component mixture in NMM, MIM and MSM for bounded sample size; (2) verify that RLMRM are more powerful to detect some specific mixtures compared to the unrestricted linear mixture regression model; (3) verify that our power and sample size formulae are accurate under a broad range of circumstances for bounded sample size.

Date: April 18, 2007
Time: 2:00 – 3:30 PM
Place: Math, 1-122

Program: AMS
Dissertation Advisor: Stephen J. Finch